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Environmental Monitoring in Finland

Present State and Development Objectives

Report to the Organisation for
Economic Co-operation and Development
Environment Committee Group on
the State of the Environment

Ministry of the Environment
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Julkaisu on tehty OECD:n ympäristökomitean ympäristön tila -ryhmälle. Raportti pohjautuu Ehdotukseen ympäristön tilan seurantaohjelmaksi (Ympäristön- ja luonnonsuojeluosaston julkaisu A:39, 1985) ja Ympäristöntutkimuksen ja -seurannan työryhmän välimietintöön (Ympäristön- ja luonnonsuojeluosaston julkaisu C/15, 1986) ja se täydentää OECD:lle laadittua raporttia Environmental Policies in Finland (Ympäristön- ja luonnonsuojeluosaston julkaisu D/19, 1986).

Julkaisu on selostus ympäristön seurannan nykytilasta ja kehittämistavoitteista Suomessa. Siinä määritellään ympäristön seuranta ja sen tavoitteet, selostetaan ympäristön seurantaohjelman pääpiirteet ja esitellään kunkin lohkon keskeisimmät seurantahankkeet. Raportissa käsitellään ympäristön seurantaohjelman toteutusta, ympäristömyrkkyjen seurantaa, ympäristönäytepankkia, bioindikaattoreita sekä yhdennettyä eli integroitua seurantaa. Lopuksi selostetaan seurantaohjelman voimavaroja ja ajoitusta sekä kansainvälisiä yhteishankkeita Pohjoismaissa, OECD:n piirissä ja muualla.

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ENVIRONMENTAL MONITORING IN FINLAND

Present State and Development Objectives

C O N T E N T S

ENVIRONMENTAL MONITORING IN FINLAND

1 Definition of environmental monitoring and its general tasks

The term environmental monitoring means the continuous or regularly repeated study of physical, chemical and biological variables. The goal is to distinguish at as early a stage as possible between those changes occurring as a result of human impact and so-called natural changes. Environmental monitoring requires study methods and their results to be comparable with each other. Environmental monitoring should also lead to the production of conclusions and recommendations for measures preventing harmful changes from occurring.

The most important objectives of environmental monitoring are the following:

(1) To ensure that the nature remains productive and diversified and that the environment stays healthy.

(2) To study in particular the changes occurring in the state of the environment on a long term basis and over large areas. The main attention is devoted to harmful changes caused by human impact, their direction, rapidity and extent.

(3) To assess, on the basis of the results obtained from monitoring, developments taking place in the state of the environment and to propose measures for the prevention of environmental disturbances.

(4) To produce the basic data and comparable results required for regional monitoring, such as studies to be carried out in urban and industrial areas.

(5) To produce data on the transportation of pollutants and their interaction in the air, the soil and water. Important subjects for monitoring are the quantities of pollutants, the rapidity of cycling, and metamorphoses.

2 Objectives of the monitoring programme

The most important objectives of the monitoring programme itself are to produce data on developments in the state of the environment and to serve environmental administration. Hence the subjects selected for monitoring purposes are projects that are expected to produce primarily data necessary for the taking of administrative decisions.

Objective 1: The monitoring programme must produce data on the state of the environment. On the basis of such information, measures for improving the state of the environment and assessment of the effects of measures already undertaken can be planned.

Monitoring of the environmental state or equivalent monitoring studies are carried out by six separate ministries and 20 research institutes. Research comparable with monitoring is also undertaken by universities in Finland. It may also be mentioned that certain central authorities (e.g. the National Board of Survey) produce data necessary for environmental monitoring. Authorities and research centres carrying out environmental monitoring notify their monitoring results using several different administrative regional divisions, for example by commune, by province, by economic region, by water district, by agricultural district, by game management area, etc. The scattered nature of the administration of activities has led to a situation in Finland in which it is difficult to obtain from monitoring an overall picture of the direction

taken by environmental changes, their rapidity and extent. For this reason an attempt is being made to tighten up on cooperation in the field of environmental research between the State research centres and the universities and, as far the circumstances will permit, to operate in the same geographical regions, in particular in the designated environmental monitoring areas. We must endeavour to gather together the scattered results of monitoring and to present the results according to water districts (catchment areas), since the latter are natural regions and hence can also be used when elucidating changes occurring in the air and soil. It must also be emphasized that the linking of monitoring data to coordinates compatible with a locality's mapping coordinate system constitutes the best way of putting environmental monitoring data into a numerical form most convenient to those requiring it.

The intention is to implement the general use of registers of local data (Land Information System, LIS) in Finland as a means to making data compatible by means of locality coordinates in the mapping coordination system.

The general attempt to introduce uniformity into environmental monitoring must not, of course, be permitted to interfere with long term, valuable and still viable monitoring programmes. Any monitoring, which after a scientific and administrative evaluation is considered valuable, must be continued and where possible developed.

Objective 2: The aim of the programme is to coordinate and steer the current non-uniform monitoring and to improve the utilization of resources and results so that monitoring would better satisfy the needs of environmental administration.

A requirement of environmental monitoring is the existence of data on the natural state of the environment in its most unaffected condition for use as a reference or control when considering the impact of human activities on areas like urban, industrial and agricultural localities. No legislative responsibilities exist respecting the monitoring of background areas, whereas the Air Protection, Water and Waste Management Acts provide an opportunity to require the polluter to monitor the quantity and effects of the emissions.

Objective 3: Initially the assesment of the background values of the environmental state variables representing the undisturbed natural state should be given priority

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3 Implementation of the monitoring programme

How the tasks of environmental monitoring are delegated among the various parties concerned depends primarily on what new system of environmental monitoring it is decided to adopt.

One viable alternative would seem to be the following:

The actual environmental monitoring work would be carried out by the State research institutes. The National Board of Waters and the Environment should occupy a central role in monitoring, as this would come under the auspices of the Ministry of the Environment. The universities would participate in certain monitoring projects in collaboration with the State research institutes. It would be left to the universities to develop new monitoring methods as well as to provide advanced and supplementary training in connection with monitoring studies.

If the State is among the financiers of these activities, the Ministry of the Environment would participate in provincial or municipal tasks in conjunction with the direction or control embodied in the regional or local monitoring programmes. If necessary, the Ministry could also elicit the help of experts.

The Ministry is responsible for the **coordination** and **steering** of environmental monitoring. To ensure that monitoring results correspond to environmental monitoring requirements, the Ministry participates in result **assessment** in cooperation with the parties involved in carrying out the work. Independent assessment ability is required in particular where the results coming from different sectors are combined and an overall picture is built up of the state of the environment in this country. In addition it must be ensured that the results of monitoring, together with their assessment, are published swiftly in a form that can be universally understood. Figure 1 shows the organizations involved in environmental monitoring, figure 2 the flow of data reflecting the state of the environment in environmental administration, and figure 3 assessment of the monitoring programme.

4 Main features of the monitoring programme

The monitoring programme takes the form of a number of projects some of which are entirely novel and some of which are based on the continuation and development of certain ongoing projects of the State research institutes and universities. The following sections summarize the most important projects of the monitoring programme.

4.1 Monitoring of the air

There are several projects associated with monitoring of the air. The most important of these is connected with the development and extension of the 11 current air quality monitoring

background stations of the Finnish Meteorological Institute in accordance with the fourth phase of the European Monitoring and Evaluation Programme (EMEP). A second air quality monitoring programme, which applies to the communes, is based on the Air Protection Act and will keep to the recommendations of the air protection working group appointed by the Ministry. The main aim is to bring the methods employed in municipal air protection research into line with each other and to improve the comparability of the results obtained. A third project is that of the development of the deposition quality monitoring programme of the National Board of Waters and the Environment. A fourth project is involved with the monitoring of heavy metal deposition using mosses. This is a joint Nordic venture (including the Faroe islands, Spitzbergen and Greenland), which is later to be joined by certain Central European countries. The Nordic Council of Ministers will be publishing the results in the form of computer maps in 1986-87. Conifer needle sulphur concentration analysis has advanced to a stage at which it provides a viable method for mapping the dispersal of air pollutants, for instance at municipal or provincial level. This method also lends itself to use in regional deposition studies on metals, chlorine and fluorine. The Finnish Meteorological Institute is also currently monitoring radioactive fall-out on 12 stations.

4.2 Monitoring of the soil environment

The vast diversity of soil ecosystems creates a situation in which there are very few universally applicable soil environment monitoring methods. One of the greatest challenges is to produce soil environment monitoring projects serving environmental administration directly. The most important facet of forest and peatland monitoring is the study being carried out by the Forest Research Institute in conjunction with the 8th Forest Inventory of 1985-86 in 3,000 permanent study areas. An attempt has been especially made to develop biological research in the trial areas. It is incidentally worth noting

that the Finnish moss specimen samples for the joint Nordic heavy metal mapping scheme are collected from these fixed sampling areas. There is still insufficient data to enable us to assess what sections of the Forest Research Institute's ILME (Effects of air pollutants on forests) project will be selected for inclusion in the environmental monitoring programme.

For soil ecosystem monitoring it is essential to maintain repetitive studies on field and forest soil composition. Such studies fall into the province of the Centre for Agricultural Research, Finnish Forest Research Institute and the Geological Survey of Finland. In addition any harmful changes occurring in decomposition activities in the soil ought to be monitored, even if initially only in the form of a simple cellulose decomposition test. Resources should be directed towards the development of microbiological tests suitable for routine monitoring duties.

4.3 Monitoring of inland waters

Hydrological monitoring is being carried out at almost 2,000 observation sites, and water quality monitoring at 3,700 observation sites. The most important monitoring projects for inland waters are those associated with the National Board of Waters and the Environments' monitoring of the quality of running waters and lake depths. The results of 20 years of practically unchanged monitoring programmes require a thorough evaluation. A change-over to a sampling programme specially designed for every observation site, needs to be seriously considered. The current physico-chemical programme ought to be supplemented by a biological programme. Research methods have advanced in recent years, and in particular the outstanding ability of the benthic fauna and sediments to integrate changes of the environment needs to be employed in routine monitoring in Finland as it is elsewhere. The monitoring programme would also cover the National Board of Waters and

the Environments' projects on lake acidification, as well as the monitoring of the quantities of materials transported into the sea by rivers. The groundwater monitoring programme of the National Board of Waters and the Environment will be continued, while groundwater quality research in particular will be developed. Again, hydrological register data are required in monitoring.

Some new forms of monitoring inland waters are the Lake Päijänne and Lake Saimaa intensified monitoring projects, and the stations of intensive monitoring established for lake ecosystems. Lakes Päijänne and Saimaa are of national importance in Finland. Their catchment areas encompass both a great deal of industry and a relatively high human population loading the waterways. Moreover, Lake Päijänne supplies water to the entire Helsinki metropolitan area. It has been proposed that lake ecosystem intensification monitoring schemes be extended to cover the following water bodies: Lake Pyhäjärvi at Säkylä (University of Turku), Lake Pääjärvi at Lammi (University of Helsinki), Lake Konnevesi (University of Jyväskylä) and Lake Kitkäjärvi (University of Oulu). Firstly, each of these lakes represents an important lake type in Finland. Secondly, major research projects, which are being carried out by the universities mentioned in parenthesis, are already underway on each of them. The monitoring of these lakes should be intensified by improving cooperation between the universities and the authorities, leading to benefits to all the parties concerned. The rivers Kokemäenjoki and Kymijoki must be brought under the intensified monitoring scheme as, for instance, they are heavily loaded by effluents and many people live within their spheres of influence.

Water body monitoring in national parks and strict nature reserves will be improved and an attempt will be made to employ water bodies and areas which over the decades have changed but little as reference waters for monitoring purposes both inland and off the coast.

4.4 Monitoring of the coastal and marine environments

The monitoring of coastal waters should be developed in accordance with the research programme of the National Board of Waters and the Environment. Particular attention should be devoted to the concentrating of activities at intensification stations (Tvärminne, Seili, North Quarken, Hailuoto and Virolahti), and the waters fronting on to the estuaries of the rivers Kokemäenjoki and Kymijoki (e.g. toxic pollutants). Monitoring of the waters of the intensification stations and river estuaries could also be intensified by creating uniformity among the activities of the National Board of Waters and the Environment, Institute of Marine Research, and Finnish Game and Fisheries Research Institute.

Monitoring taking place on the open sea will accord with the second phase of the Baltic Monitoring Programme of the Baltic Sea. Finland also has international research agreements with the Soviet Union and Sweden.

4.5 Monitoring of toxic pollutants

The monitoring of pollutants encountered in the natural environment is one of the most vital tasks of the programme from the standpoint of the national health, carrying capacity of the environment, and nature conservation. The monitoring programme includes a register of those organisms and other components which are collected for toxicological determination. In selecting these, either international or Nordic recommendations have been adopted, since in different countries the comparability of analyses carried out on the same organisms using the same methods greatly adds to the value of monitoring.

When choosing toxic pollutants for monitoring purposes, a stand has to be taken on the extent to which resources are to be used for so-called classic pollutants, and to what extent

they are to be channelled into studies on "new" toxins. Classic pollutants from the monitoring standpoint are DDT and its derivatives (DDD, DDA and DDE), PCB and metallic mercury. In Finland monitoring ought also to cover at least the major pollutants of the wood processing industry that are conducted to the environment; of these, the most disturbing are chlorinated phenols and lignins. Similarly, monitoring should also be applied to the most prominent pesticides employed in modern agriculture, e.g. MCPA and toxaphene (the latter is brought to Finland by long-range air pollution). A decision should also be made on the necessity for monitoring PAH compounds and dioxins. The Finnish Centre for Radiation and Nuclear Safety is responsible for the monitoring of radionuclides.

Environmental samples are collected from the air, soil, water and populations of living organisms for storage in so-called specimen banks. The latter are essential from the environmental monitoring standpoint as the material stored in them is required for comparative purposes, for example in studies concerning the changes taking place in the concentrations of a particular toxic pollutant over a several-year period, or when endeavouring to trace "new" environmental toxins.

4.6 Monitoring areas and integrated or cross-media monitoring

A suggestion has been made previously that a score or so of environmental monitoring areas be established in Finland which would constitute focal points for environmental research carried out by the State's various research institutes and by the universities. The absence of compatibility between studies carried out repeatedly in the same areas would make it impossible to build up any overall picture of changes occurring in the environment.

Integrated or cross-media monitoring constitutes one of the most important aspects of activities in the monitoring areas. The term integrated monitoring means studies carried out

simultaneously on the air, the soil and water in the same place in which both physico-chemical and biological methods are used. Using integrated monitoring first and foremost the transport of pollutants by the air and their effects are studied in limited areas. A monitoring area of this kind has to satisfy the following requirements:

(1) The area should be forest dominated, in a more or less natural state, and its continuation in that form safeguarded.
(2) The area must have clearly defined limits.
(3) The size of the area varies from a few dozen hectares to a few square kilometres.
(4) The area is representative of the flora and fauna of the natural geographical region in which it lies (soil profile, forest type, etc.).
(5) The area includes a small lake with a stream flowing from it.

An area of integrated monitoring is a real ecologically functioning unit in which it is possible to study the causes of changes occurring in the environment and their effects. Since the overall study of this ecosystem calls for cooperation between several State research institutes and universities, the utilizisation of the results by the various parties increases severalfold, savings are made in effort, and resources can be used for other lines of monitoring. Moreover, the overall picture required by monitoring on the interdependence of the air, the soil, and water is also obtained.

Cross-media monitoring is carried out on a joint basis between the Nordic countries under the direction of a working group appointed by the Nordic Council of Ministers (e.g. Miljökvalitetsövervakning i Norden, NORD 1981 = Environmental monitoring in the Nordic countries). The monitoring grid of the combined Nordic operation comprises 26 areas of integrated monitoring, of which eight are located in Finland. The Nordic working group in the spring of 1985 published the programme for the first phase of integrated monitoring.

Initially the material balance of the small catchment area (including input and output, in which deposition + weathering (dissolution) is roughly equivalent to net accumulation and runoff) will be studied. The programme was revised and modified at meetings of the working group in 1985-86. At a later stage of integrated monitoring the biological content of the programme will be increased by, for example, population and community studies.

5 Development objectives

The monitoring of the environment as outlined above is not of course comprehensive from the viewpoint of environmental administration needs. The most important development goals have already been listed in conjunction with several projects (monitoring of benthic animals, monitoring of sediments, general development of forest and peatland monitoring, toxic pollutants from the wood processing industry, the environmental specimen bank, microbiological monitoring methods, etc.).

In addition attention should be paid to the connection of environmental monitoring with the following Ministry of the Environment projects at least: monitoring of endangered and rare animal and plant species; environmental protection studies in the communes and provinces; the noise study (e.g. monitoring of dispersal and effects); monitoring of the man-made environment; monitoring of changes in land use.

In conjunction with cooperative efforts between the State research centres and the universities, the development of new methods of monitoring, education, the intensive study of lake and coastal ecosystems, and biological research projects associated with integrated monitoring, have already been mentioned. Fresh suggestions are eagerly awaited from the universities, for example respecting the development of bioindicator methods suitable for Finnish conditions, and the monitoring of soil ecosystems. Again, the role of university

biological museums in monitoring serving the interests of environmental administration needs studying.

The Ministry should also be aware of the application of technical developments in environmental monitoring. The largest collection of new methods is that of remote monitoring, where satellite and aerial photography techniques are made use of in environmental monitoring and for which international commercial services already exist.

6 Resources and timing

In preparing the environmental monitoring programme discussed in this report it was apparent at the outset that the programme could only be accomplished in stages. As the acquisition of new resources is notoriously difficult, an endeavour is being made to utilize current resources in a planned fashion. A fundamental aspect of the programme is the compatibility and re-deployment of current resources in order to make monitoring serve the interests of environmental administration decision-making and environmental research needs as fully as possible.

Certain activities of State reesearch institutes already include environmental monitoring or equivalent tasks (Fig. 1). The main aim of this research is not to serve environmental monitoring directly but, for example, to serve it through agriculture, water power generation, game and fish management, etc. Many of these research projects provide monitoring data only secondarily or indirectly.

All in all there exists no calculation concerning how much Government reserves are employed for environmental monitoring.

It can, however, be stated that, for instance, the water districts have indicated in conjunction with a questionnaire sent out for other purposes that about 10 % of their research resources are put into environmental monitoring.

The quantity and quality of data obtained through environmental monitoring and the resources required for this naturally depend on to what extent mnonitoring is implemented. In preparing the programme published here the point of departure has been that the parsimony in the State budget is likely to continue. This "budget realism" has also restricted the extent and scientific content of the monitoring programme - in many people's opinion, to far too large a degree. To place our national environmental monitoring on a moderately scientific footing and permit it to serve environmental policy decision-making satisfactorily, it must be emphasized that the programme should be implemented now to the extent described and in 5 - 7 years, or in other words at the latest by 1992.

The implementation of the environmental monitoring programme in the years 1985 - 1991 consists roughly of three phases:

(1) The first phase, covering the period 1985 - 1986, has been limited mainly to the integration and re-deployment of the present resources. New resources have been acquired for the purpose of establishing the first cross-media or integrated monitoring areas and for the initiation of limited activities.
(2) During the second phase of implementation, taking place in 1987 - 1989, fresh resources will be required, particularly for the cross-media or integrated monitoring that forms such a fundamental part of the programme (see section 4.6). Integrated monitoring is based on more integration between the State's various research institutes and the universities and on concentrating on the same study areas. In this way integrated monitoring will enable the resources to be used most economically.
(3) During the third stage of implementation, which is to take place in 1990 - 1991, the need for fresh resources will be at a premium. In this phase monitoring will reach the planned extent in all its aspects. The results of monitoring and their assessment will also be regularly available

for the purposes of decision-making in the communes and provinces. Attention must be paid to making sure that the results and their assessment are published swiftly, regularly and in a form that can be understood by the general public.

The implementation of the environmental monitoring programme as from 1992 will require a sum amounting to FIM 8 - 15 million a year, depending on the level of the objectives set and the opportunities for re-deploying resources.

Table 1. Scheduling of the environmental monitoring programme in the period 1985 - 1991

Year	Phase	Most important objectives
1985		Agreement on details of monitoring programme and review of latter.
	I	Methodological tests.
1986		Development and establishment of monitoring cooperation between State research institutes
1987		Initiation of Phase I cross-media or integrated monitoring (Nordic joint venture). Start up of environmental specimen bank activities.
1988	II	Development of soil monitoring. Publication of assessment of first monitoring results.
1989		Alterations to programme on basis of assessments (Figure 3).
1990		Initiation of Phase II of cross-media or integrated monitoring (biological part).
	III	Development of bioindicator methods.
1991		Monitoring programme acquires the projected extent indicated in this report.

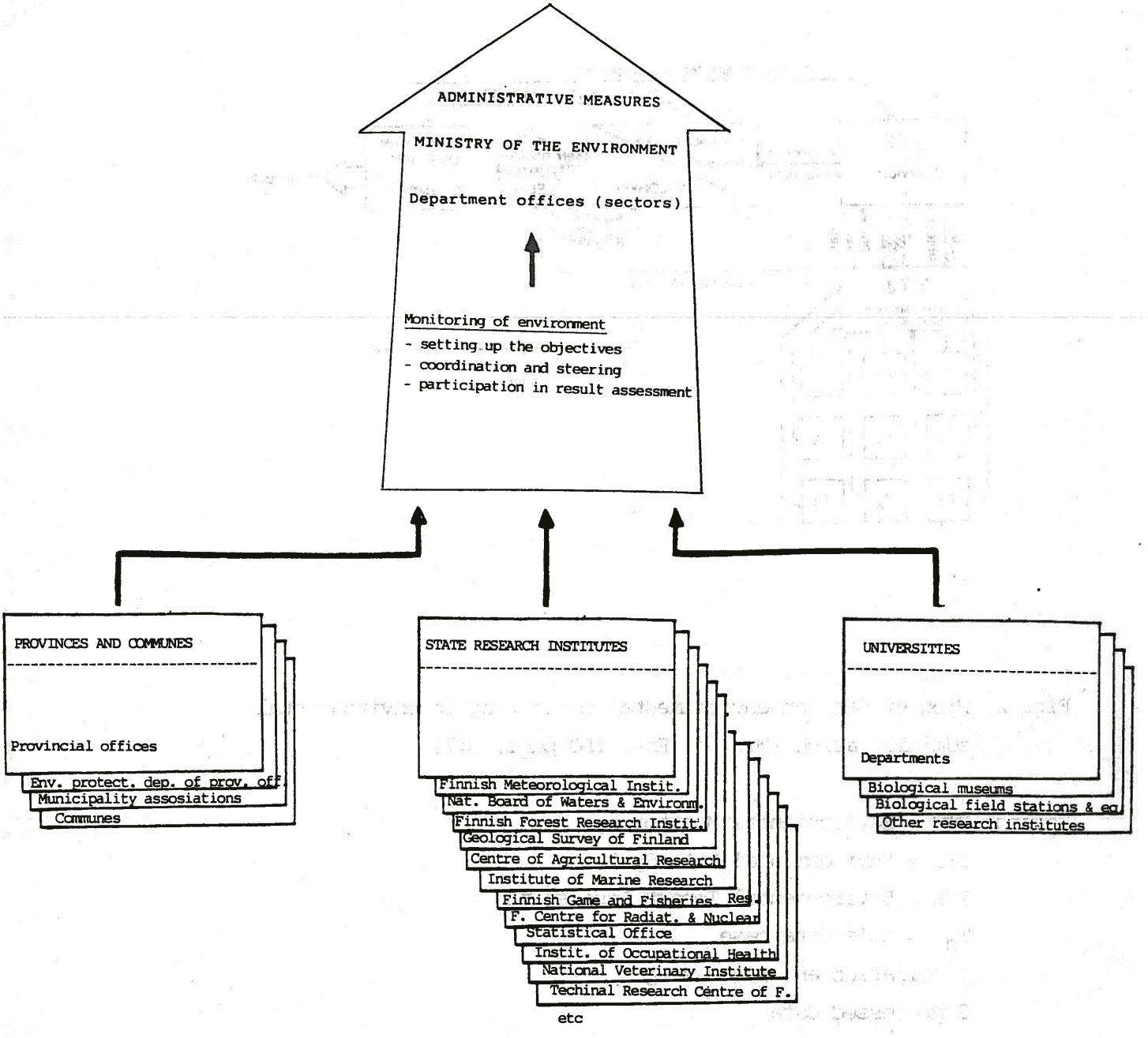

Fig. 1. Organization of environmental monitoring in Finland

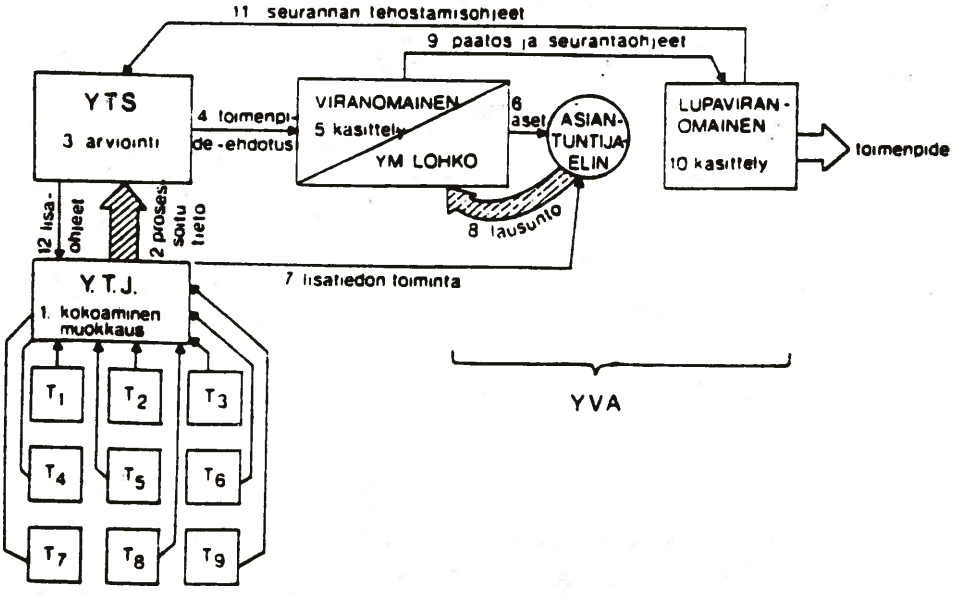

Fig. 2. Flow of data on environmental monitoring in environmental administration (Min. of Env. YLO publ. D:7)

Legend: YTS = Environmental Monitoring
YTJ = Environmental Data System
YVA = Environmental Impact Assessment
T_n = file/data base
1 collation and processing
2 processed data
3 assessment of environmental monitoring (see also Fig. 3)
4 proposal for measures
5 OFFICIAL handling
6 EXPERT BODY
7 additional data
8 statement
9 decision and monitoring directives
10 AUTHORITY ISSUING PERMIT; handling; ⟶ measure
11 monitoring intensification directives

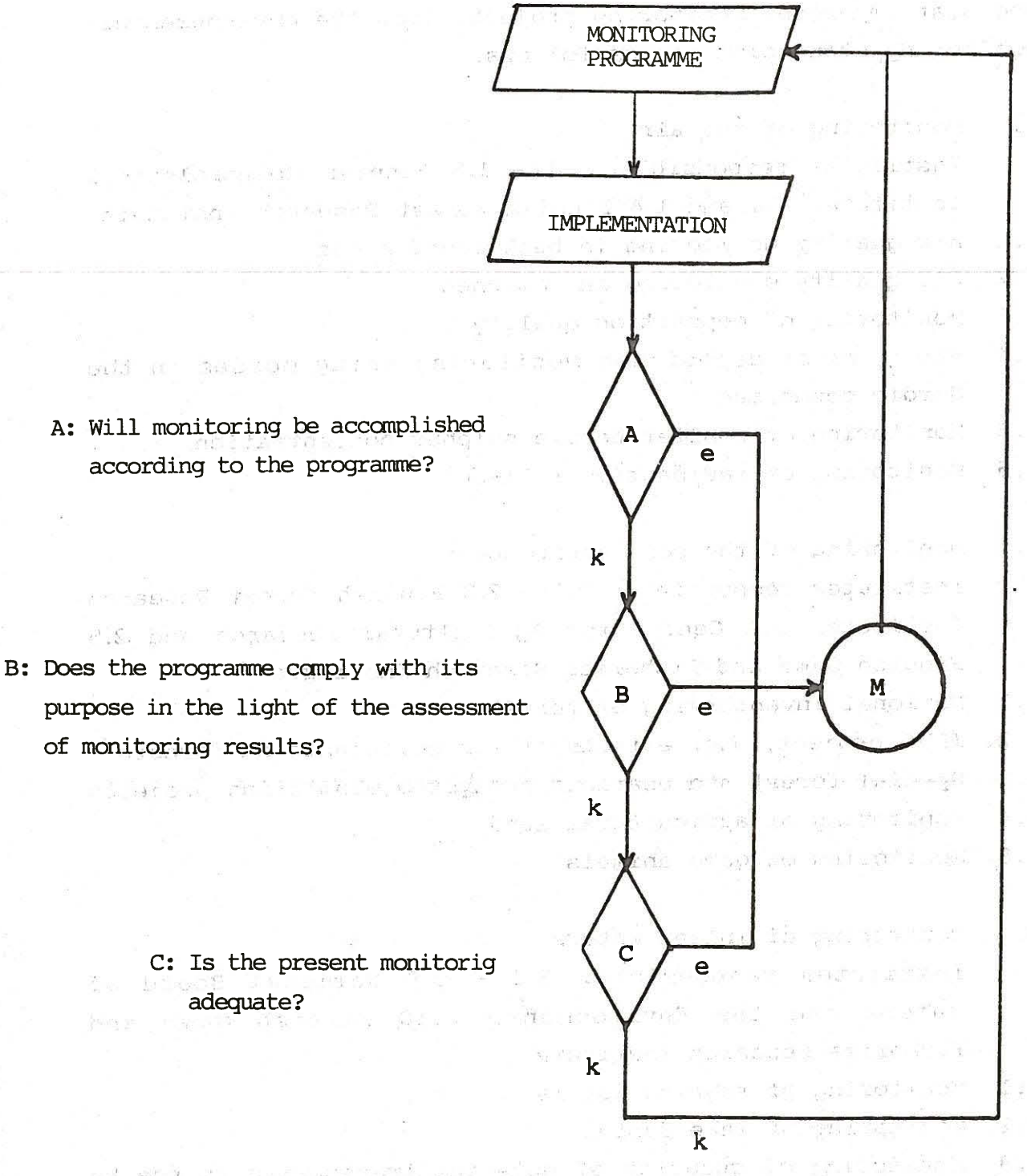

Fig. 3. Monitoring programme and assessment of the projects.
A - C = assessment phases, M = programme modification,
k = yes, e = no

LIST OF PROJECTS IN THE ENVIRONMENTAL MONITORING PROGRAMME

The most important monitoring projects from the environmental monitoring standpoint are as follows:

1. Monitoring of the air
   Institutes responsible: 1.1 - 1.3 Finnish Meteorological Institute, 1.4 and 1.4 Finnish Forest Research Institute
1.1 Air quality monitoring in background areas
1.2 Air quality monitoring in communes
1.3 Monitoring of deposition quality
1.4 Heavy metal deposition monitoring using mosses in the Nordic countries
1.5 Monitoring of conifer needle sulphur concentration
1.5 Monitoring of radioactive fall-out

2. Monitoring of the soil environment
   Institutes responsible: 2.1 - 2.3 Finnish Forest Research Institute, 2.4 Centre for Agricultural Research and 2.5 Finnish Game and Fisheries Research Institute
2.1 National inventorying of forests
2.2. ILME project, i.e. effects of air pollutants on forests
2.3 Special forest and peatland ecosystem monitoring projects
2.4 Monitoring of agricultural land
2.5 Monitoring of game animals

3. Monitoring of inland waters
   Institutes responsible: 3.1 - 3.9 National Board of Waters and the Environment, 3.10 Finnish Game and Fisheries Research Institute
3.1 Monitoring of running waters
3.2 Monitoring of lake depths
3.3 Monitoring of quantity of material transported to sea by rivers
3.4 Monitoring of lake acidification
3.5 Monitoring of lake ecosystems at intensification stations
3.6 Intensified monitoring of Lakes Päijänne and Saimaa

3.7 Intensified monitoring of Rivers Kokemäenjoki and Kymijoki
3.8 Monitoring of water bodies in national parks and strict nature reserves
3.9 Monitoring of reference waters
3.10 Monitoring of fish stocks

4. Monitoring of groundwater
Institute responsible: National Board of Waters and the Environment

5. Monitoring of coastal and marine environment
Institutes responsible: 5.1 - 5.3 National Board of Waters and the Environment, 5.1 and 5.4 Institute of Marine Research, 5.5 Finnish Game and Fisheries Research Institute
5.1 General coastal and marine environment monitoring
5.2 Monitoring of coastal ecosystems on intensification stations
5.3 Monitoring of waters fronting on to Rivers Kokemäenjoki and Kymijoki
5.4 Monitoring of marine environment (Baltic Monitoring Programme)
5.5 Monitoring of fish stocks

6. Monitoring of toxic pollutants
Institutes responsible: 6.1 - 6.2 National Board of Waters and the Environment (later perhaps in association with the Central Biological Museum), 6.3 Finnish Centre for Radiation and Nuclear Safety
6.1 Environmental specimen bank
6.2 Environmental toxin monitoring programme
6.3 Radionuclide monitoring

7. Remote monitoring
Institutes responsible: National Board of Survey and Technical Research Centre of Finland

7.1 Utilization of aerial and satellite photographs in environmental monitoring

8. Environmental monitoring areas
Institutes responsible: all

8.1 Establishment of areas

8.2 Preparation of monitoring programme for each area

9. Cross-media or integrated environmental monitoring
Institutes responsible: all

9.1 Establishment of areas and start-up of activities

9.2 National integrated monitoring

9.3 Nordic integrated monitoring (=10.2)

10. Nordic cooperation on environmental monitoring

10.1 Monitoring of heavy metal deposition using mosses in Nordic countries

10.2 Nordic integrated monitoring

10.3 Other Nordic cooperation on environmental monitoring

11. Other international cooperation
Institutes responsible: appropriate institute/ Ministry of the Environment

12. Special projects in environmental monitoring

13. Collaboration with parties providing funds for environmental research serving the needs of monitoring (e.g. environmental science committee of Academy of Finland, and certain private Funds).

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